



## From Volume to Value: Prospects and Pitfalls in Organising Integrated Dry Eye Practice Units

Jody Paige Goh<sup>1</sup>, Dirk F De Korne<sup>2,3,4,5,6,7</sup> and Louis Tong<sup>1,2,3,4\*</sup>

<sup>1</sup>Yong Loo Lin School of Medicine, National University of Singapore, Singapore

<sup>2</sup>Singapore National Eye Centre, Singapore

<sup>3</sup>Singapore Eye Research Institute, Singapore

<sup>4</sup>Duke-NUS Medical School, Singapore

<sup>5</sup>KK Women's & Children's Hospital, Singapore

<sup>6</sup>Erasmus School of Health Policy and Management, Rotterdam, Netherlands

<sup>7</sup>Health Services Innovation, University of Tasmania, Australia

\*Corresponding author: Louis Tong, Singapore National Eye Centre, 11 Third Hospital Avenue, Singapore, Tel: 65-62277255; Fax: 65-6322-4599; E-mail: [louis.tong.h.t@singhealth.com.sg](mailto:louis.tong.h.t@singhealth.com.sg)

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### Abstract

With the advent of aging populations, chronic multifactorial diseases will dominate and strain existing models of health care. A model of healthcare delivery that emphasizes seamless, integrated, team-based care and remuneration for patient outcomes, have proven advantageous in diseases like diabetes mellitus, compared to systems based on isolated medical services. It is, however, unclear whether major chronic ophthalmic diseases including dry eye are also suitable for this model. Multiple co-morbidities such as depression, anxiety, post-menopausal mood swings, sleep disorders, and chronic neuropathic pain in dry eye greatly and unexpectedly increase its healthcare burden, and also produce high levels of patient and physician frustration. Many patients benefit from counseling, social support, and psychological management, but are frustrated by multiple referrals and inefficiency in care coordination. With the new model, patients may have a seamless transition between care settings, better experience and improved outcomes, and likely attain added value per unit cost.

**Keywords:** Eye diseases; Health policy; Practice guidelines as topic; Primary health care; Quality of health care

### Rethinking Care for Chronic Diseases

The trend of medical sub-specialization with the development and proliferation of organ-based or medical technique-based healthcare centers has clearly benefited many generations of people in developed and even developing countries [1]. The advantages of providing high-end care are mainly in single, acute problems requiring specialized skills. However, incurable and disabling chronic multi-organ diseases are increasing, due to aging of communities and partly, success of specialized disciplines in management of treatable maladies. We define chronic disease as by WONCA International Classification Committee: a health condition that is long in duration-often with long latency and protracted course, multi-factorial in aetiology, no definite cure, changes gradually over time, heterogeneous in susceptibility" [2], including the lived experience of coping with health disruption and impact on psychological and social function [3].

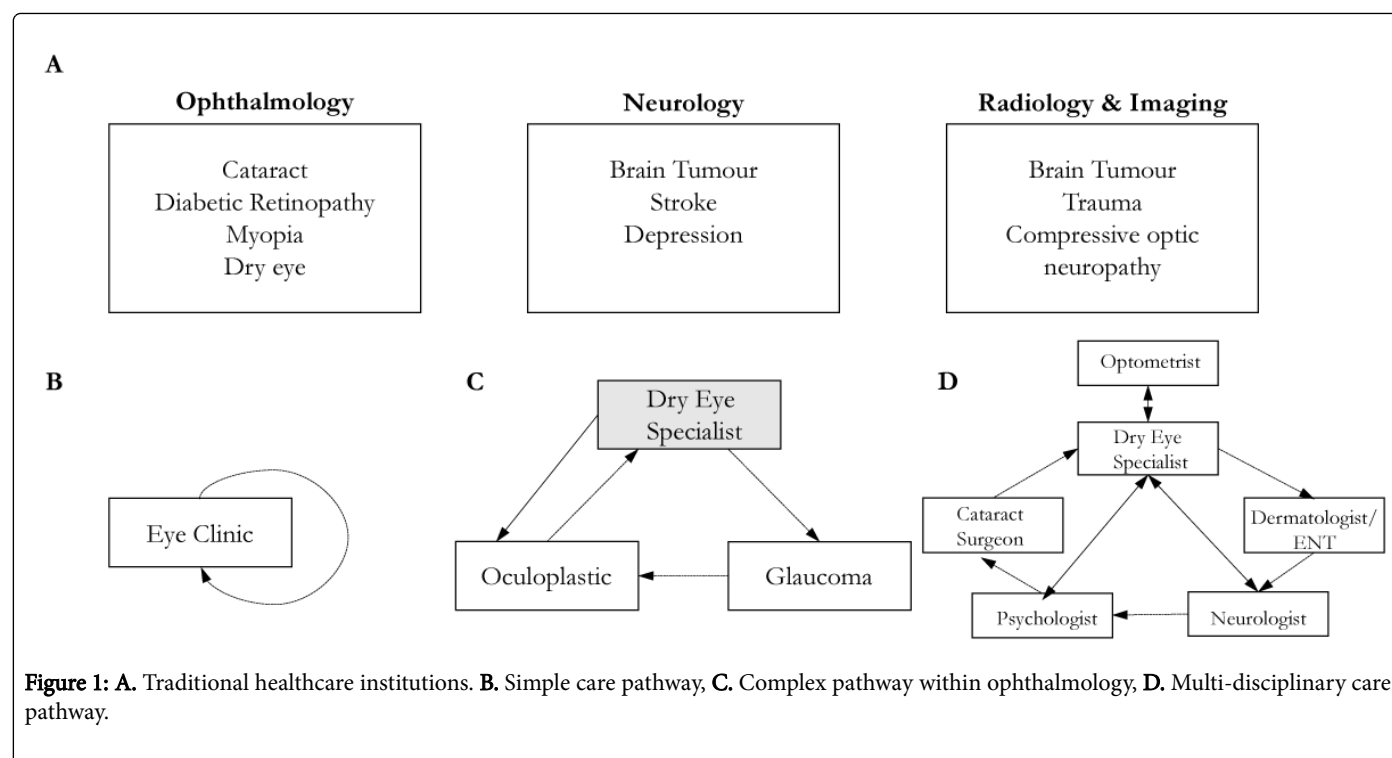
In chronic diseases with multiple comorbidities, health-care disciplines should be integrated and centered on the patient. The "Esther network" [4] and Ed Wagner's chronic disease model [5] are examples of integration across the entire continuum of care, including self and community care, which also cater to the bio psychosocial needs of a person [6]. A study involving 113,452 unique patients evaluated the integration of primary healthcare family practice, internal medicine and geriatric practices, and found superior outcomes

in terms of depression screening rates and increased adherence to care, with less emergency visits/admissions [7].

The traditional model of healthcare, pivoted around specialized tertiary centers (Figure 1A), is not optimized for chronic disease care. Traditional healthcare models are largely 'serviced-based', whereby patients are typically charged for each individual service offered, be it a consultation, procedure or operation. To be truly patient-centered, an outcomes-based approach, defined beyond medical outcomes, is necessary. In a 'care delivery chain', remuneration for such outcomes produce the best value for the costs incurred [7,8].

The conformity to streamlined coordinated pathways with minimal variation in care leads to routinisation of processes that increases practice capacity. Coordinated care has been commonly employed in management of diabetes mellitus, involving endocrinologists, ophthalmologists, vascular surgeons, dieticians and podiatrists [9]. Other successes of coordinated care programs have been observed in pharmacy programs, general medical units, and primary care [6].

We propose the formation of dedicated practice units, which can incorporate three key features: multidisciplinary integrated care, assessment of patient-reported outcomes, and coordinated care protocols. This proposed model can only be advantageous with a large patient volume which requires team-based care with well-characterized protocols. Here, we illustrate the possible utility of our proposed model of healthcare in chronic diseases by identifying dry eye as a candidate disease for implementation. This discussion has wider significance in the care of other chronic diseases.



## Dry Eye as a Clinical Problem

Dry eye is an under-rated problem in healthcare and its healthcare delivery can be improved. The prevalence of dry eye has struck epidemic levels, and challenged the notion that care should be only conducted in expensive and highly-specialised centres. As the condition is not curable, high costs (direct and indirect) are inevitably sustained and a significant financial burden laden upon society. The economic burden on the USA may amount to \$55 billion USD per year [10,11]. Furthermore, it inflicts a huge impact on the patients' quality of life functional capacity and work productivity [12,13]. Symptoms, the driver of dry eye morbidity, significantly impair physical and mental functioning, and the impact of moderate-to-severe dry eye symptoms is almost equivalent to that of severe migraine [14].

Regrettably, the current standard of care in dry eye remains generally unsatisfactory from both the patient's and the physician's points-of-view. In an open letter from a patient community addressed to ophthalmologists -"Many of us have spent thousands of dollars visiting countless specialists who, after lengthy waiting periods, have often dismissed or ignored our symptoms and clinical picture, offering minimal, outdated, ineffective treatments not specific to our condition". Evidently, there is much room for improvement in achieving patient satisfaction in the management of this condition.

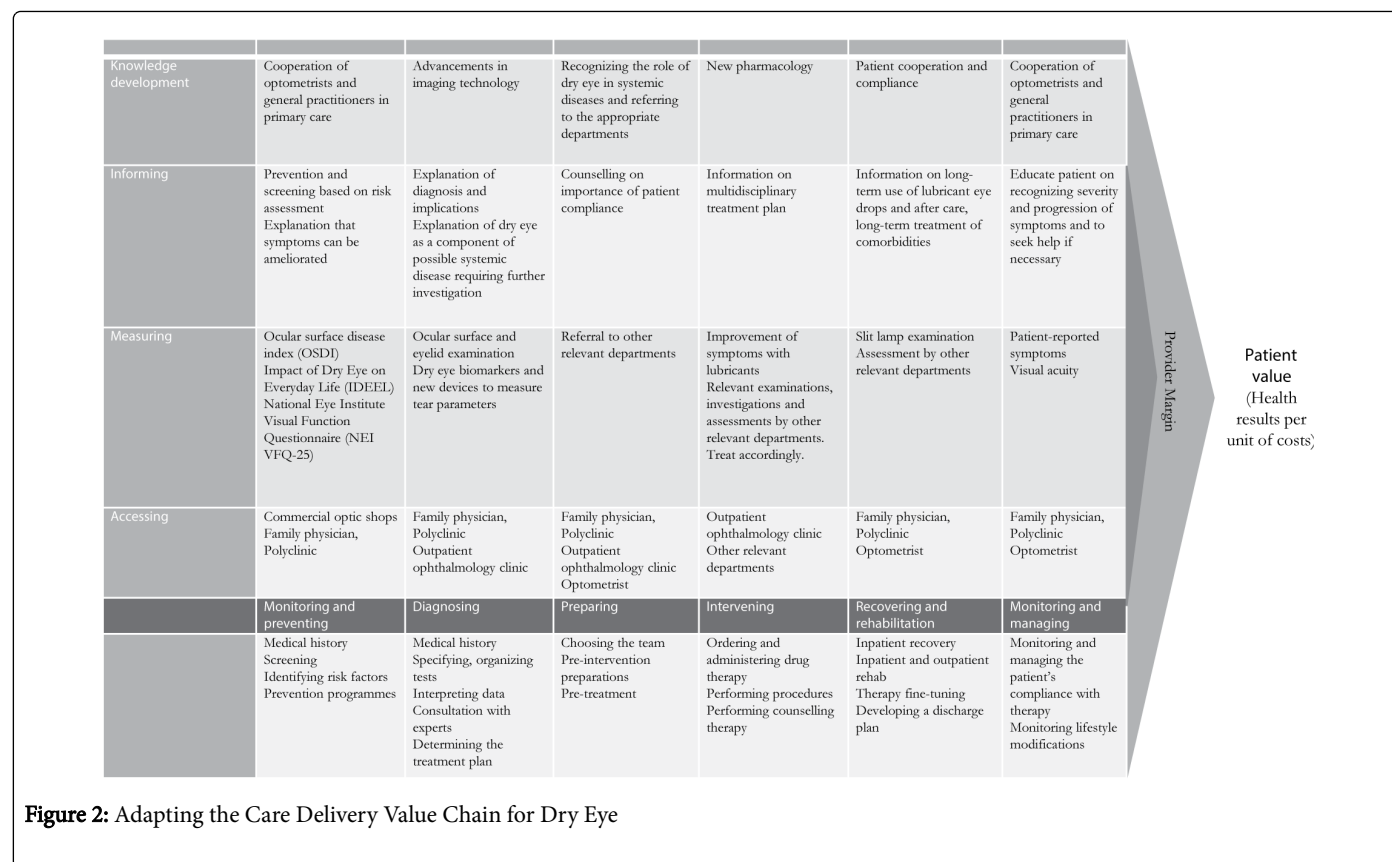
Chronic systemic comorbidities commonly compound dry eyes, and this suggests that management under a single traditional medical department may not suffice [7,15]. Patients with dry eye reported a higher frequency of chronic pain syndrome (irritable bowel syndrome, pelvic pain), which is associated with worse ocular and non-ocular pain scores. Patients who reported symptoms of neuropathic ocular pain share causal genetic factors with chronic pain syndrome. Indeed, neuropathic ocular pain may represent a central pain disorder, and

that shared mechanistic factors which predispose patients to certain forms of dry eye. It is therefore recommended that evaluation and treatment for neuropathic pain should be considered in dry eye patients [16]. Other commonly associated comorbidities in dry eye include sleep disturbances [17], anxiety and depression [18], migraine [14], rheumatological disease and allergies like sinusitis [19]. Dry eye was also found to be associated with significantly reduced happiness [20], which qualifies it as a 'lifestyle' disease. The concurrence of these conditions in a single patient may demand holistic and simultaneous psychological, neurological, rheumatological, Ear-Nose-Throat and even medical social worker (MSW) attention. This contrasts with ophthalmic conditions such as cataracts or refractive errors-in such conditions, simple workflows (Figure 1B) may be sufficient, whereas in dry eye, more complex routes with intra-hospital or inter-hospital referrals are often needed (Figures 1C and 1D).

## Care Delivery Value Chain in Dry Eye

Porter and Teisberg proposed a care delivery value chain in which healthcare should be focused on added value for the patient throughout the entire process [8]. The value-oriented approach focuses on integrated treatment and services for not just the disease but also its comorbidities. The continuum of activities over time is cyclical, consisting of monitoring, preventing, diagnosing, preparing, intervening, managing and further monitoring.

For each stage of care, 3 criteria are crucial to define value. First, patient must have access to care throughout the process. Second, there should be assessment of the severity and progression of disease at the different stages of care. Finally, patients must be informed and educated in their care. Figure 2 shows how the value chain may be adapted to the management of dry eye in the population.



## Patient Perspectives of Improved Care

The dry eye practice unit combines the experience of different professionals, and would thus better manage patients with multiple comorbidities. Since every comorbidity influences the treatment outcome of another like a 'domino-effect', it should be regarded as important as the primary condition. Previously, a systematic review suggested that intervening in specific risk factors like depression in patients with multiple co-morbidities can improve several health outcomes. Targeting depression alone results in a modest reduction of comorbidities, with a standardized mean difference (SMD) of -2.23 (95% confidence interval (CI) -2.52 to -1.95). Concomitant improvement in participant and provider behaviour was also observed [15].

By training primary care optometrists in dry eye, seamless transition between primary and tertiary care may be facilitated. This offers greater convenience for patients, and helps augment efficiency of processes through enhanced inter-career communication. In a similar vein, patient expectations will be more transparent, better managed and kept uniform throughout the care process. Tight scheduling may otherwise require shuttling between different clinics, resulting in non-attendance at dry eye clinics [21]. Patients are also less likely amenable to billing surprises related to unexpected referrals or sudden increases in services required to maintain adequate management of their health, since traditionally payments are based on each service provided.

## Systems-Level Benefits in Proposed Model

Coordinated care delivery increased the capacity to handle care processes. While a traditional practitioner, including a specialist

ophthalmologist, needs to handle hundreds of medical scenarios, the variability faced in the dry eye practice unit would be relatively limited. Each professional would therefore possess greater expertise in a single disease entity, i.e., dry eye. Because of greater competency of team members, even non-medical personnel can become the overall coordinator within the practice unit.

The proposed system focuses on patient-physician agreed goals, aligning the interests of both parties. In contrast, traditional reimbursements are based on procedures, and favour the quantity, but not necessarily the quality of care dispensed. For example, the dry eye patient who suffers from sleep disturbances is more likely to be satisfied by improved sleep but not necessarily, by mere changes in objective ocular signs. The new system will involve targets of care that is agreed upon at the onset of care and re-evaluated at intervals, e.g., yearly. In traditional care, publicly-supported hospital departments often have tight budgets, and if there is already pressure to serve their 'own' patients, there will be less incentive to deal with inter-disciplinary patients. For example, if neurology departments are currently overwhelmed with the management of strokes and dementia, there is little capability to engage dry eye patients with neuropsychological issues. The proposed model of care overcomes this inappropriate attitude by ensuring that there is adequate and dedicated budgeting for chronic inter-disciplinary patients.

Standardised protocols facilitate documentation of electronic health information, which facilitates inter-carer communication and audits. For example, communication between the rheumatologist and ophthalmologist is critical. Rheumatologists prescribe immunosuppression for systemic autoimmune disease, which may alter the severity of dry eye. Since the range of diagnostic information

is relatively limited in a practice unit compared to a traditional hospital, it should be easier to audit outcomes. Improved auditing greases the wheels for more meticulous organizational learning, and improves education and training of health professionals.

Finally, streamlined care pathways may save resources at the system level, as there will be diminished administrative hurdles to be overcome in inter-professional care. Traditionally, referrals from one discipline to another may incur wastage of both time and resources. Although cost savings have not been demonstrated in the context of dry eye, applying a coordinated care model in hypertension has illustrated overall cost savings. In spite of implementation costs amounting to \$22.9 billion, \$25.3 billion of medical costs could be saved, resulting in a net reduction of costs [22]. It has been shown in elective coronary artery bypass surgeries that use of patient navigation aid, seamless transition of care and rational reimbursement can improve standards of care and still reduce cost significantly [23]. More recently, an uncontrolled, pre-post, longitudinal, observational study measuring quality and outcomes relative to cost at University of Utah Health Care involving clinical projects such as total hip and knee and joint replacement, hospitalist, laboratory utilization and management of sepsis showed both reduced costs and improved quality with a shift from volume to value. Compared with the baseline year, mean direct costs were shown to be 7% lower in implementation year and 11% lower in the post-implementation year [24]. There could be a role for implementation of a value-driven outcomes tool to achieve similar cost-reductions in the care of dry eye.

## Challenges in Outcomes-Based Care in Dry Eye

Challenges exist in the formation of a dry eye practice unit. There are no universally accepted parameters to measure outcomes in dry eye, but outcomes should be multi-dimensional. Dry eye patients complain of visual problems and dysesthesias such as burning. Tools that evaluated both symptoms and relationship to activities include the Ocular Surface Disease Index (OSDI), Impact of Dry Eye on Everyday Life (IDEEL) and the National Eye Institute Visual Function Questionnaire (NEI VFQ-25). In addition, complications of treatment, for example, the need for hourly lubricants, or the increased intraocular pressure and secondary glaucoma arising from the use of corticosteroid eye drops, should rightly be included as outcomes. One should be aware that symptoms may be altered by activity avoidance, patient attitudes and compliance to treatment, and accessibility of treatment [25,26].

The role of newer biomarkers including tear osmolality and matrix metalloproteinase-9 needs to be better defined. The practice may also consider the possibility of dynamically measuring tear parameters. The pathophysiology of “dry eye” is complex and can comprise problems of tear production (e.g., Sjorgrens syndrome), or in tear evaporation, more commonly encountered in the general population [27]. It is challenging to integrate diverse measures into a single outcome.

Since dry eye multifactorial, there may be a need to stratify patients along major pathways within the practice unit. There may be a need for triaging criteria which consider disease severity and care requirement [28]. As an example of differential care requirement, an older patient with rheumatoid arthritis may need psychological and rheumatological care, whereas a younger patient may need dermatological or immunological care-to treat concomitant allergies. However, pre- screening may reduce patient acceptability, so the number of care pathways should be kept low [2,3].

While a single unifying purpose guides each practice unit, performance assessment of individual team components may still be needed [29]. Fair remuneration may be more complex than in traditional settings, but can still adhere to historical norms for professional categories. Inevitably, apart from quality of care, payment may also vary in accordance with volume of patients cared for. It is therefore pertinent to achieve a balance on both volume and quality matrices in determining external remuneration. Additionally, some short term costs may be incurred. This is because a small, but nonetheless significant, increase in administrative personnel may be unavoidable, as the new model of care does not obviate existing traditional departments.

There is some uncertainty whether this model will perform satisfactorily for certain healthcare settings and regional cultures. In Singapore, patients show a preference for tertiary care since there are few barriers to tertiary care (e.g., minimal cost disincentives) compared with primary care. This is largely attributed to government subsidies allocated to tertiary care. Clinics from different hospital departments are independent units with separate billing and appointment systems, even though they are under the same institution. In contrast, hospital bills in each hospital admission are consolidated and are partly payable by Medisave (compulsory insurance for nationals). The relative subsidies in tertiary over primary care, and the isolation of hospital clinics will be hurdles to overcome.

## The Way Forward

With the increasing prominence and burden of chronic diseases, a discernable shift away from traditional models of care seems inevitable. When patients, taxpayers and health policy makers are increasingly insistent on greater accountability, an approach that encourages greater efficiency, transparency and patient empowerment will be prioritised. Traditional healthcare centres are organized and administered by disciplines according to the training and formal accreditation programs of physicians, and are not well integrated. While acute intervention pathways such as cataract surgery can sometimes be managed by a single discipline, in other settings, such as multi-organ trauma, it may be optimised with the proposed new care model. Chronic diseases would need practice units that embody the new healthcare model proposed above.

To facilitate this tide of change in the delivery of care for chronic diseases, further research will be required to determine appropriate outcome measures. Reviews of published international standards that emphasize on patient well-being would be useful, and in fact, may be used for prevention of symptomatic disease in the community. Standards from the international consortium of outcomes measurement (ichom.org) currently do not include dry eye disease, but when these standards are applied to dry eye, they will likely include the multi-disciplinary, holistic outcomes that characterize chronic diseases. Such outcomes will definitely measure more accurately the health of individuals in the future. Practitioners and teams from various disciplines should highlight the potential gains of changing the status quo to policy makers, if they encounter diseases that favor the proposed changes.

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